

# MALARIA CONTROL IN CALIFORNIA

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Malaria in California is confined to certain fairly well-defined regions, chiefly the Sacramento-San Joaquin valley and the adjacent foothills. There is but little doubt that the agricultural development of this vast area has been, and still is, greatly retarded by the prevalence of the disease. Certain districts are notoriously malarial, and property is in some instances depreciated at least 50 per cent. Compared with the malaria death rate of 4.8 per 100,000 population given by the 1910 census as the average for the entire registration area in the United States, certain districts show extremely high malaria death rates, as for example the Shasta-Tehama-Butte county area, for which the California State Board of Health statistics give a death rate of 46.8 per 100,000, and the Placer-Sacramento-San Joaquin county area, with a rate of 20.4 per 100,000.

On the basis of the death rate from malaria, Dr. William F. Snow, Secretary of the California State Board of Health, has conservatively estimated that the state sustains an annual economic loss of \$2,820,000, of which 80 per cent., or \$2,256,000, is preventable. Yet this fact has been largely viewed with apathy, indifference, or derision. If this loss were sustained by the live stock of the state, it is safe to say that ample funds would be supplied by both the state and the federal government to control the disease, and the public would clamor for its extermination.

In a few isolated instances, however, some anti-malaria work has been done with a fair amount of success. Its inception occurred as a result of the lectures of William B. Herms, Assistant Professor of Entomology in the University of California, during the runs of the Agricultural and Horticultural Demonstration Train. This train has seven cars of exhibits, one-half of one car being given to rural health problems. During the first two seasons of the operation of this train no interest in malaria control was manifested, but in 1910 considerable work was done. As each campaign was a separate effort, in widely separated districts, they will be considered briefly and individually.

The first work was commenced in March, 1910, at Penryn, Placer County, the center of a large deciduous fruit region, and notoriously malarial. It had been preceded by lectures on malaria, given at the request of the citizens by Professor Herms, in the adjacent towns of Auburn, Newcastle, Penryn, Loomis and Roseville, Penryn being the only town to effect an organization and raise funds. Professor Herms superintended the field operations and placed certain of his university students in charge

of the field work. The field men were paid at the rate of \$75 per month, but in only three months did they devote full time to the work, a total of 180 working days being put in, though the operations extended over a period of six months.

With the slender funds available but little drainage work was done, and the use of oil was chiefly relied on to destroy the mosquitoes. No quinine prophylaxis was attempted. The campaign continued from March to November, considerable educational work being done in the last two months. The results obtained can be seen from the school attendance reports, which show a reduction of 46 per cent. in the number of absences from malaria as compared with the previous year. The area covered was about six square miles, and the cost of the campaign was \$715.75, divided about as follows:

Equipment.....	\$30.83
Materials (Oil, freight, etc.)*.....	39.47
Field Agents (Salary and expenses).....	498.40
Expert's Expenses (Herms).....	129.15
Incidentals.....	17.90
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Total†.....	\$715.75

In 1911 it was intended to carry on the anti-malaria campaign in Penryn, but operations were not begun pending the action of the state legislature in regard to a bill providing for the formation of special anti-mosquito districts, by the operation of which money could be raised by taxation for the conduct of anti-malarial measures. Unfortunately, this bill was badly constructed and, though passed by the Legislature, was properly vetoed by the Governor. Upon the failure of this bill, it was found impossible to raise the necessary money for the campaign (one man gave half of the money in 1910, but demanded that this year every one pay his proper share), and so no work was done. Efforts to raise money for this year have failed so far, though undoubtedly a majority of the residents are in favor of carrying on the campaign.

The second campaign was commenced in Oroville, Butte County, the field work beginning the last of March, 1910. A local organization, the "Oroville Anti-Mosquito League," raised the money needed by various methods. The campaign was supervised by Professor Herms, and the records of the dredger companies showed from 50 to 75 per cent. less absences from work on account of malaria, as compared with former years. Unfortunately, no records of the cost of the work were kept, but I believe that the sum expended was about \$800. One man was employed to perform the field work at a salary of \$75 per month.

\* Approximately 360 gallons of 32 degrees Baumé, treated stove oil used.

† Does not include cost of horse and rig, which was donated.

Oroville continued the campaign in 1911, but devoted part of its energies to the reduction of the numbers of houseflies, with a resulting improvement in the sanitary condition of the town, and a further apparent reduction in the prevalence of malaria. No actual statistics were available, as in the previous year. Cost records were kept up to the first of August, when the trained man in charge of the field operations was replaced by a laborer. This was necessitated by the lack of funds. The cost of continuous work from April first to August first was as follows:

Field Agent . . . . .	\$500.00
Materials (Oil, Freight, etc.)* . . . . .	58.95
Rig Hire . . . . .	48.00
Incidentals . . . . .	26.60
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Total . . . . .	\$633.55

One of the results of the 1911 campaign was the installation of an efficient Board of Health, and the passage of new public health ordinances. The campaign is now in progress for the season of 1912, under the direction of this new Board of Health, a local man with no training in entomology doing the field work. The monthly salary of this man (\$75) is paid by the trustees from the general fund, and the health officer has given his salary (\$30) for the purchase of oil and other expenses. A committee of five women is assisting in locating mosquito breeding places.

The city of Bakersfield commenced an anti-mosquito and anti-fly campaign in August, 1910, \$1,000 being raised for the purpose by the anti-mosquito committee of the Woman's Club of that city. This campaign was continued until June, 1911, when it stopped for lack of further funds. The general sanitary conditions were materially improved, but we have no statistics on the subject and no cost data. Mosquito control is a difficult matter in Bakersfield, as it is surrounded by marshes, and the prevailing winds carry thousands of Culicines into the city every day of the breeding season. The Anophelines were very greatly reduced.

In September, 1911, a request was received by Professor Herms from the Los Molinos Land Company, owning 10,000 acres of irrigated land in Tehama County, to assist in controlling malaria on this project. The writer made a preliminary report on the subject in that month, and anti-malaria work is now proceeding under his direction. During the winter the irrigation system has been revised, enlarged and improved, and drainage provided. At present two laborers are constantly at work on drainage and oiling. Money for the prosecution of the campaign is being liberally provided by the company, and with sufficient funds assured the success of the work is certain. The campaign is being carried on systematically.

\* Approximately 360 gallons of treated stove oil (32 degrees Baumé), and 160 gallons water white kerosene.

All cases of malaria are reported and investigated, card indexes are used, and all breeding places are mapped and recorded as to treatment. Accurate cost records will be kept and educational publicity will be undertaken by the local press.

At present there are several communities that are attempting to organize campaigns and raise money for their prosecution, but it is too soon to make any statement in regard to them. Three main propositions are now under consideration, viz.: amending the state "Sanitary Districts Act" at the next session of the Legislature, so that its provisions may be used for the formation of districts for the control of malaria, and the raising of money for the purpose by local taxation; the obtaining of a state appropriation for a comprehensive campaign over the whole malarial area; the obtaining of aid from the federal government for a detailed study of the problem the results of this study to be used as a basis for extended operations when funds are available.

In the meantime, constant publicity is being kept up in the newspapers of the state, and the people are hammered hard on the subject every winter by the lecturers of the rural health exhibit on the "Demonstration Train." Progress is disappointingly slow, but none the less sure.

In all the campaigns carried on so far, with the exception of the Los Molinos project, which has not progressed far enough as yet to show results, the money available has been pitifully inadequate for the purpose. As the campaigns have been inaugurated by committees of citizens, no legal authority or dignity has been given to the movement, and even the laws have been found to be ineffective. As a result of having so little money to work with, but very little permanent improvement has been made, compared with what is possible. Mosquito control has been the system of prophylaxis, this control being based on the oiling of breeding places. No quinine prophylaxis has been attempted, both on account of lack of funds, and because of the American citizen's belief in his inherent right to poison himself and his family with patent remedies if he wants to. And yet, in spite of these difficulties, marked results have been obtained, results which show conclusively that under the management of a trained and experienced person, supplied with sufficient money, and backed by proper laws and legal authority, malaria can be at the very least largely reduced in its prevalence, and in time probably completely exterminated in certain regions of California.